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## EDITORIAL

### British Standards Institution

THE Annual Report of the British Standards Institution continues to testify to the large amount of important work which that organization is performing. In particular the Chemical Division has got well into its stride and some fifty specifications are stated to be nearing completion as the result of the labours of nearly the same number of technical committees on many of which our Society is represented. As the appreciation of the benefits to be derived from standardization increases, we may expect an ever-growing number of these specifications so that in time chemicals in commerce will have just as definite a meaning in regard to their purity as they now have in theory in regard to their structural formulæ. Coal, for example, in the past has been rarely sold on any other basis than as coal and attempts to buy it on a basis of calorific value or of ash content have been discouraged by the sellers; it would be true to say that coal has been degraded rather than ennobled. One among the many reasons for such attitude has been the difficulty of sampling coal, particularly run-of-mine or large coal and the completion of British Standard methods for sampling such coal marks a definite step in advance: the specification should be of assistance both in the home and in the export trade. There is a considerable amount of very valuable work to be done in relation to methods of coal and coke analysis and it is satisfactory to note that the Institution has seriously got down to this problem. It remains a paradox to us to find how little is known about coal, our chief industrial raw material, the source of much of our wealth as well as of our political anxieties. Coal is somehow associated with poverty—poverty in the material sense among those who win it, and according to some outspoken veterans lack of feeling among those who handle its many problems. These say that the Fuel Research Board has hardly fulfilled expectations and that it has concerned itself with expensive investigations which were best left to the industries concerned, excellent though its work has been. The specifications prepared for phenol, cresols, cresylic and carbolic acids, are confidently expected to provide a satisfactory basis for commercial [illegible] in the tar acid industry; to any layman the standardization of tar must appear no mean achievement. Chemistry, of course, enters in more or less degree into most of the engineering standard specifications, as also into those for building materials, of which there are a large number awaiting proper standardization in terms which the chemist alone can supply. Only those who have to erect a works and demand materials somewhat out of the ordinary to stand up to special conditions, have experienced the futility of the existing so-called descriptive claims for constructional materials and the need of expressing their composition or properties in concise and accurate language. Chemical engineering has a section of its own in the list; nowhere is there more need for standardization than among vessels of stoneware, of metal, and of glass. The activities of the Standards Institution may be gauged from two figures; it has been responsible for all but a thousand committee meetings and has sold or distributed nearly one hundred thousand specifications. The Institution does all this work on a remarkably small budget and deserves the support of every industrial enterprise in the country for all benefit by its labours; fortunately, it enjoys generous State support. The work of its technical committees is entirely of a voluntary character and represents generous support by the individual and his employer. In the short time since its formation the Chemical Division, which as is well known is under the chairmanship of Dr. E. F. Armstrong, has fully justified the hopes which were expressed at the time of its inception.

### Visits to Newcastle Works

The Annual Meeting at Newcastle was a memorable one for several reasons, one of which was the importance of the papers read at the sessions of the Chemical Engineering Group, the Food Group, and the Plastics Group. The engineering papers will duly appear in the Proceedings of the Group; the food papers will appear in this JOURNAL next week and the plastics paper in the near future. Another reason was the variety aud interest of the various works, which the kindness of the owners allowed us to visit; not only were we allowed to see the work in progress and to study the processes, but when the time of the visit was appropriate we were regaled with more than adequate refreshment. Billingham was the place that everyone had heard about and was anxious to visit and a large party enjoyed this privilege; many others could not be accommodated there and look forward to another opportunity. Mr. J. W. Craggs and Dr. G. E. Stephenson took a great deal of trouble to arrange these visits, and to them and Messrs. P. D. Scott, W. T. Ivison, E. M. Myers, F. H. Walker, H. E. Cox, and R. R. Bennett we are indebted for several of the reports appearing this week.

# FURFURAL, AN INDUSTRIAL RAW MATERIAL AND SOLVENT

By A. J. HAMMER

The title of this paper may be somewhat misleading to the chemist who has been watching the development of the synthetic resin industry or who has been interested in industrial solvents. To a large number of industrial and research chemists, however, furfural still remains either a laboratory curiosity or an example of something that can be made from the waste material of a great industry. Comparatively few have thought of it as a raw material but in the past decade chemical industries have recognized a number of properties which make it valuable either as a raw material or as an industrial solvent.

The increase in the importance of this compound to the chemical industries can best be shown in its price history and production since 1922.[1] Before that year very little of the compound was available and that only at prices varying from $6·50 to $30 per lb. In January, 1922, its manufacture was first undertaken on a commercial scale and it was then possible to obtain fairly large quantities at $1 per lb. During that first year, while the method of manufacture was being perfected to a higher degree, the price dropped to 50 cents in March, to 35 cents in July, and finally to 25 cents in September. This price remained until January, 1926, when it was lowered to 17·5 cents and in May of the same year it was again lowered to 15 cents per lb. Since 1926 the price has dropped to 10 cents and there may be a possibility of a lower price some time in the future. With the decrease in the price of the compound there has been a corresponding increase in its production. In 1922 an order for 500 lb. would probably have taxed the capacity of the equipment while at the present time the minimum price is based on yearly contracts of 150,000 lb. to be delivered in car load lots.

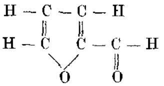
The discovery of furfural is accredited to Döbereiner[2,3] who, in 1830, while preparing formic acid by the action of manganese dioxide and sulphuric acid on sugar, found that the distillate came over milky and, after standing, a yellow " oil " separated out. He succeeded in obtaining only a small amount of this material, not enough to make any extensive investigation of its nature. The " oil " was described as having an odour similar to that of a mixture of oil of bitter almonds and oil of cinnamon and was given the name " artificial oil of ants." A short time later Emmett[4] reported that an oil was formed when formic acid was prepared from rye or corn by treating it with sulphuric acid.

Stenhouse[5] was the first to make any quantity of this " oil." He used a process similar to that used by Emmett, using oatmeal and sawdust as his raw materials. He succeeded in obtaining an ounce of the " oil " from 12 lb. of meal. The composition of the " oil " was determined and given the formula $C_5H_4O_2$. The effect of treating it with acids and alkalis was studied and several of its physical constants determined. More recent determinations of these physical constants indicate, however, that Stenhouse was working with a very impure product.

The compound was given the name of furfurol by Fownes[6] who prepared it by the distillation of bran ' sulphuric acid. He suggested the name furfurol f furfur, meaning bran, and oleum, oil. When the a hyde nature of the compound had been studied, it bec known as furfur-aldehyde, which we now abbreviat furfural. Fownes also prepared the ammonia compo to which he gave the name furfurol amide. This c pound is now known as hydrofuramide.

Stenhouse in 1850[7] prepared " oils " from a numbe vegetable sources and found that they were simila that previously prepared from oatmeal and sawd From some classes of vegetable growth, especially weeds, there was an " oil " obtained which he thou to be an isomer of furfural and to which he gave name fucusol. Later Maquenne[8] and Tollens[9] pro this material to be a mixture of furfural and me furfural.

Ulrich[10] was probably the first to throw any ligh the structure of furfural when he prepared furoic and furfuryl alcohol from furfural and potass hydroxide in 1860. The final proof of the structure made by Harries[11] in 1901 by direct synthesis of fu from succinic dialdehyde and water. The formula furfural is now universally accepted as :



Furfural is by no means a new product to the a cultural chemist. He has been preparing it as an in mediate product in the determination of pentoses pentosans[12] for a number of years by distilling the san with 12% hydrochloric acid, precipitating the furf in the distillate with phloroglucin and from the wei of the furfural phloroglucide so obtained, calculating percentage of furfural, pentoses, or pentosans by formulæ given by Kröber.

Furfural's increasing popularity is due to an enorm industry's endeavours to find a better means of reve from one of its waste materials. The oat hulls fro single oatmeal mill amount to nearly 200 t. a d A small percentage of these may be used in certain st feeds but the greater part must be disposed of in o ways. The problem of increasing the digestibility of hulls by converting a portion of the cellulose into su by hydrolysis with acids was thoroughly studied but experimental results did not promise any large retur

It was about this time that furfural was recognize a valuable compound and an extensive study was m of its preparation from corn cobs by LaForge and government chemists associated with him, and in Iowa State College chemical engineering laboratori The yield of corn cobs in America amounts to s 20,000,000 t. a year while the yield of oat hulls is ab 6,000,000 t. Although corn cobs produce a higher y of furfural, the problem of gathering them togethe any one point prohibits their use as a raw mate As oat hulls are to be had in large quantities at cereal mill of the Quaker Oats Company at Ce Rapids, Iowa, it was only natural that this comp

hould adopt furfural as a means of disposing of its waste material.

Furfural has been prepared from a wide variety of materials such as cane sugar, wood, glucose, peanut hulls, cotton seed hulls, and albumen and may be prepared from nearly all of the pentosan-bearing cellulosic materials.[14] The yield that may be expected from the present process of manufacture is not sufficient, however, to warrant the use of all these as raw materials. The oat hulls as used contain about 32 to 36% pentosans, 5% cellulose, and from 10 to 15% lignin[1] from which it is possible to obtain about 10% of furfural. The theoretical yield is about 20%[15] which makes the present process 50% efficient.

The Quaker Oats Company at Cedar Rapids, Iowa, is perhaps the largest manufacturer of furfural. The method adopted by this company was developed by the Miner Laboratories[14] and is probably the most efficient process now in use. Although a number of methods of producing it have been proposed at various times, very few of these seem to have been practised. In the Miner process the oat hulls from the mill are ground and then fed into large rotating digesters where they are treated with sulphuric acid and digested under a pressure of 60 lb. of steam per sq. in.

The digesters are large steel autoclaves 8 ft. in diameter by 12 ft. long arranged horizontally to rotate slowly about their longitudinal axis. They are driven by individual motors through speed reducers and a spur gear. The inner surfaces of the digesters are protected by an acid resisting lining which is designed to resist the abrasive action of the hulls. In operation each digester is charged with 5000 lb. of hulls and 1500 lb. of water containing 100 lb. of 66° Bé sulphuric acid. This is just enough to moisten the hulls but contrary to previous practice, is not enough to leave any surplus. Charging is accomplished through a convenient manhole in the side of the digester. When the pressure in the digester reaches 60 lb., the outlet is opened and the vapours containing furfural are drawn off. The admission of the live steam and its withdrawal are so regulated from this point that the pressure inside the digester is kept at approximately 60 lb. throughout the operation. Three of these digesters, operating on a cycle of 6 to 8 hours, yield a production of about 5000 lb. of furfural a day.

From the digesters the vapours are carried through a separator where the velocity is reduced and the hulls which are carried over are allowed to separate. From the hull separator the vapours are carried to the fractionating column where the furfural is separated. The furfural from this column, containing about 16% water and 15/100 of 1% acetic acid, is fed into a dryer where it is purified to 98% or 99%. This product is the ordinary grade of technical furfural but for certain commercial uses it is further purified by vacuum distillation. After the digestion, the residue hulls are conveyed to a dryer where a large percentage of the moisture is removed. They are then burned under specially-designed boilers where they produce considerable heat energy. The percentage of furfural remaining in the residue hulls has been found by Brownlee[15] to vary between 1·75% and 5·35% depending upon the ratio of hulls to the water used in the initial charge. The waste material from the process consists of the ash which has a high silica content and has possibilities as a filtering medium or a mild abrasive. The waste liquors from the fractionating column also contain small amounts of acetic acid but in amounts too small to warrant their recovery.

Because of its aldehyde properties, furfural can be used to replace formaldehyde in the manufacture of such materials as embalming fluids[13] and synthetic resins. Because of its toxic properties it may also be be used in the manufacture of certain repellents, larvicides, fungicides, disinfectants, preservatives for biological specimens, and antiseptics. The medical examination of several men who have been in charge of the furfural process for a number of years indicates that the vapours have very little toxic effect on human beings.

The solvent properties of furfural make it valuable in the purification of certain chemicals and in the manufacture of paints and varnishes. Its high penetrating power prohibits its storage in wooden barrels but this property also makes it valuable as a material for dipping fence posts and as a weed exterminator.

Of the furfural derivatives, the following are available in commercial quantities: furoic acid, which is a light grey solid and may be used as a bactericide or a fungicide and as a latent solvent for cellulose esters; calcium furoate; butyl furoate, used in the manufacture of lacquers; hydrofuramide, used in the synthetic resin industry; furfuryl alcohol, used as a selective solvent; and tetrahydrofurfuryl alcohol, used as a solvent for many organic products.

The following tables show the solvent action of furfural and three of its derivatives on a number of organic compounds. In making these determinations, no attempt was made to determine the degree of solubility other than that which might be designated by the terms "not soluble," "partly soluble," or "completely soluble." The term "soluble" as used in these tables means only completely soluble or completely miscible. Furfural reacts with a number of organic compounds, particularly the amines, amides, and certain of the inorganic acids and their esters. In cases where a darkening of the sample or the formation of a precipitate occurred, these samples were recorded as reacting with the solvent. In some cases where crystallization occurred on standing, the solid may have been either the solute or a new compound.

In a number of cases an attempt was made to bring about complete solution by raising the temperature; 65° C. was the maximum temperature used.

### Furfural as a Solvent

In making these tests a definite volume or weight of the chemical, depending upon whether the solute was a solid or a liquid, and a measured quantity of refined furfural were added to a test tube. This was then stoppered and shaken several minutes and if the material did not go into solution completely, the test tube was warmed by placing it in warm water.

For convenience, the compounds used in these determinations were divided into solids and liquids.

*Liquids*

| Chemical | Amount of solute | Furfural | Solubility |
|---|---|---|---|
| | c.c. | c.c. | |
| Acetone | 10 | 15 | soluble |
| Amyl acetate | 10 | 15 | soluble |
| Amyl alcohol | 10 | 15 | soluble |
| Aniline oil | 10 | 15 | soluble, reaction |
| Anisidine (ortho) | 10 | 10 | soluble |
| Benzaldehyde | 10 | 10 | soluble |
| Benzine | 10 | 10 | soluble |
| Benzyl chloride | 10 | 10 | soluble |
| Benzyl acetate | 10 | 10 | soluble |
| Benzyl alcohol | 10 | 10 | soluble |
| Brombenzol | 10 | 10 | soluble |
| Bromoform | 10 | 10 | soluble, reaction |
| Butyl acetate | 10 | 10 | soluble |
| Butylic alcohol | 10 | 10 | soluble |
| Butyric acid | 10 | 10 | soluble |
| Castor oil | 10 | 10 | soluble |
| Chinawood oil | 10 | 10 | soluble |
| Chlorbenzol | 10 | 10 | soluble |
| Chloroform | 10 | 10 | soluble |
| Collodion | 10 | 10 | soluble |
| Cottonseed oil | 10 | 10 | soluble at 55° C. |
| Cresylic acid | 10 | 10 | soluble, reaction |
| Crotonaldehyde | 10 | 10 | soluble |
| Dichloracetic acid | 10 | 10 | soluble, reaction |
| Dichloroethyl ether | 10 | 10 | soluble |
| Dichlorobenzol | 10 | 10 | soluble |
| Diethylaniline | 10 | 10 | soluble |
| Diethyleneglycol-mono-butyl ether | 10 | 10 | soluble |
| Diethyleneglycol-mono-ethyl ether | 10 | 10 | soluble |
| Diethyl phthalate | 10 | 10 | soluble |
| Diethyl sulphate | 10 | 10 | reaction |
| β-dihydroxyethyl ether | 10 | 10 | soluble |
| Dimethyl aniline | 10 | 10 | soluble |
| Dimethyl sulphate | 10 | 10 | reaction |
| Nitrous ether | 10 | 10 | soluble |
| Ethyl acetate | 10 | 10 | soluble |
| Ethylaceto acetate | 10 | 10 | soluble |
| Ethyl bromide | 10 | 10 | soluble |
| Ethyl benzylaniline | 10 | 10 | soluble |
| Ethyl carbonate | 10 | 10 | soluble |
| Ethylene chloride | 10 | 10 | soluble |
| Ethylene chlorohydrine | 10 | 10 | soluble at 60° C. |
| Ethylene dichloride | 10 | 10 | soluble |
| Ethylene glycol | 10 | 10 | soluble |
| Ethyleneglycol-monobutyl ether | 10 | 10 | soluble |
| Ethyleneglycol-monoethyl ether | 10 | 10 | soluble |
| Ethylmethyl ketone | 10 | 10 | soluble |
| Glycerol | 10 | 10 | practically insoluble |
| Amylic alcohol | 10 | 10 | soluble |
| Butylic alcohol (iso) | 10 | 10 | soluble |
| ropyl alcohol (tech) | 10 | 10 | soluble |
| sopropyl ether | 10 | 10 | soluble |
| Lactic acid | 10 | 10 | soluble |
| ard oil | 10 | 10 | soluble at 60° C. |
| inseed oil | 10 | 10 | soluble at 50° C. |
| Menhaden oil | 10 | 10 | soluble at 35° C. |
| Methyl acetate | 10 | 10 | soluble |
| Neatsfoot oil | 10 | 10 | soluble at 60° C. |
| Nitrobenzol | 10 | 10 | soluble |
| Nitrotoluene | 10 | 10 | soluble |
| araldehyde | 10 | 10 | soluble |
| eanut oil | 10 | 10 | nearly soluble at 60° C. |
| ormal propyl alcohol | 10 | 10 | soluble |
| ape seed oil | 10 | 10 | nearly soluble at 60° C. |
| perm oil | 10 | 10 | nearly soluble at 60° C. |
| etrachloroethane | 10 | 10 | soluble |
| Toluidine | 10 | 10 | soluble, reaction |
| Turkey red oil | 10 | 10 | soluble |
| Whale oil | 10 | 10 | soluble at 50° C. |
| Valerianic acid | 10 | 10 | soluble |
| Xylol | 10 | 10 | soluble |
| Xylidine | 10 | 10 | soluble, reaction |

*Solids*

| Chemical | Amount of solute | Furfural | Solubility |
|---|---|---|---|
| | g. | c.c. | |
| Acetylsalicylic acid | 5 | 10 | not soluble |
| α-naphthol | 5 | 5 | soluble, reaction |
| α-naphthylamine | 5 | 5 | soluble |
| Amide phenol | 5 | 5 | reaction |
| Anthracine | 5 | 20 | not completely soluble |
| Anthranilic acid | 5 | 5 | reaction |
| Anthraquinone | 3 | 20 | not soluble |
| Benzidine | 5 | 10 | reaction |
| Benzoic acid | 5 | 20 | soluble at 43° C. |
| β-naphthol | 5 | 10 | soluble |
| β-naphthylamine | 5 | 20 | soluble |
| British gum | 5 | 20 | not soluble |
| Caffeine | 5 | 20 | not soluble |
| Camphor (gum) | 5 | 5 | soluble |
| Camphor (monobrom) | 5 | 7 | soluble |
| Carbazole | 5 | 15 | not soluble |
| Chloral hydrate | 5 | 5 | nearly completely soluble |
| Casein | 5 | 20 | not soluble |
| Citric acid | 5 | 20 | not soluble |
| Chloramine | 5 | 20 | not soluble |
| Dichlorobenzol (para) | 5 | 10 | soluble when warm |
| Diphenyl | 5 | 20 | soluble |
| Diphenylamine | 5 | 5 | soluble |
| Dextrose | 5 | 20 | not soluble |
| Dianisidine | 5 | 20 | reaction |
| Diphenylguanidine | 5 | 10 | soluble at 65° C. |
| Hexamethylenetetramine | 1 | 10 | not soluble |
| Monochloracetic acid | 5 | 5 | soluble at 50° C. |
| Naphthionic acid | 5 | 5 | not soluble |
| Dinitrochlorobenzine | 5 | 5 | soluble at 50° C. |
| Michler's ketone | 5 | 10 | not soluble |
| Nitraniline (meta) | 5 | 10 | soluble at 55° C. |
| Naphthalene | 5 | 5 | soluble at 60° C. |
| Dinitrophenol | 5 | 5 | soluble at 50° C. |
| Iodoform | 5 | 5 | not soluble |
| Dinitronaphthalene | 5 | 5 | not soluble |
| Cellulose acetate | 3 | 10 | soluble |
| Quinine | 5 | 15 | not soluble |
| Nitrotoluene (para) | 5 | 5 | not soluble |
| Nitrophenol (ortho) | 5 | 5 | not soluble |
| Oxalic acid | 5 | 5 | not soluble |
| Nitrosodimethylaniline (para) | 5 | 5 | reaction |
| Nitrophenol (para) | 5 | 5 | apparent reaction |
| Nitraniline | 3 | 10 | not soluble |
| Sodium acetate | 5 | 5 | not soluble |
| Nitrochlorobenzene (ortho) | 5 | 5 | soluble when warm |
| Phenylenediamine (meta) | 5 | 5 | reaction |
| Saccharin | 5 | 5 | not soluble |
| Phthalic anhydride | 1 | 5 | soluble |
| Sodium benzoate | 5 | 5 | not soluble |
| Resorcin white | 3 | 5 | soluble |
| Stearic acid | 5 | 10 | soluble at 50° C. |
| Thiocarbonilide | 5 | 10 | not soluble |
| Triphenylguanidine | 5 | 10 | soluble at 50° C. |
| Sodium naphthionate | 5 | 10 | not soluble |
| Tannic acid | 5 | 10 | not soluble |
| Tribromphenol | 5 | 10 | soluble at 50° C. |
| Sulphanilic acid | 5 | 10 | not soluble |
| Trichloroacetic acid | 5 | 5 | soluble |
| Sodium picramate | 5 | 10 | not soluble |
| Tartaric acid | 5 | 10 | not soluble |

### Normal Butyl Furoate as a Solvent

…n each case in which the solvent action of the furfural …rivatives was determined, 5 g. of the solute, or 5 c.c. …the solute was a liquid, were placed in a test tube and …c. of the solvent added. These test tubes were then …owed to stand for several days at room temperature …d were then examined and the results recorded.

All this work was carried on at room temperature. …cause of the high viscosity of some of these derivatives, …higher temperature would facilitate their use as …vents.

| Solute | Amount of solute | Amount of solvent c.c. | Remarks |
|---|---|---|---|
| …tanilide | 5 g. | 10 | not completely soluble, crystal formation |
| …tylsalicylic acid | 5 g. | 10 | crystal formation |
| …aphthol | 5 g. | 5 | not soluble, crystal formation |
| …tone | 5 c.c. | 5 | soluble |
| …aphthylamine | 5 g. | 10 | soluble |
| …line oil | 5 c.c. | 5 | soluble |
| …idophenol (ortho) | 5 g. | 10 | not soluble, apparent reaction |
| …nophenol (para) | 5 g. | 10 | not soluble, apparent reaction |
| …yl acetate | 5 c.c. | 5 | soluble |
| …yl alcohol | 5 c.c. | 5 | soluble |
| …isidine (ortho) | 5 c.c. | 5 | soluble |
| …thracene | 5 g. | 10 | not soluble |
| …thranilic acid | 5 g. | 10 | apparent reaction |
| …thraquinone | 5 g. | 10 | not soluble |
| …nzaldehyde | 5 c.c. | 5 | soluble |
| …nzene | 5 c.c. | 5 | soluble |
| …nzidine | 5 g. | 10 | not soluble |
| …nzoic acid | 5 g. | 10 | crystal formation |
| …nzyl chloride | 5 c.c. | 5 | soluble |
| …nzyl acetate | 5 c.c. | 5 | soluble |
| …nzyl alcohol | 5 c.c. | 5 | soluble |
| …aphthol | 5 g. | 10 | crystallization |
| …aphthylamine | 5 g. | 5 | not soluble |
| …ombenzol | 5 c.c. | 5 | soluble |
| …omoform | 5 c.c. | 5 | soluble |
| …tyl acetate | 5 c.c. | 5 | soluble |
| …tyl alcohol | 5 c.c. | 5 | soluble |
| …tyric acid | 5 c.c. | 5 | not soluble |
| …feine | 5 g. | 5 | not soluble |
| …mphor (gum) | 5 g. | 5 | not soluble |
| …mphor, monobrom | 5 g. | 5 | not soluble |
| …rbazole | 5 g. | 5 | not soluble |
| …sein | 5 g. | 5 | not soluble |
| …stor oil | 5 c.c. | 5 | not soluble |
| …llulose acetate | 1 g. | 5 | not soluble |
| …inawood oil | 5 c.c. | 5 | soluble |
| …lorbenzol (mono) | 5 c.c. | 5 | soluble |
| …loral hydrate | 5 g. | 5 | not soluble |
| …loramine | 5 g. | 5 | not soluble |
| …loroform | 5 c.c. | 5 | soluble |
| …ric acid | 5 g. | 5 | not soluble |
| …conut oil | 5 c.c. | 5 | not soluble |
| …llodion | 5 c.c. | 5 | soluble |
| …ttonseed oil | 5 c.c. | 5 | soluble |
| …sylic acid | 5 c.c. | 5 | soluble |

### Tetrahydrofurfuryl Alcohol as the Solvent

| Solute | Amount of solute | Amount of solvent c.c. | Remarks |
|---|---|---|---|
| …etanilide | 5 g. | 10 | crystal formation |
| …etone | 5 c.c. | 5 | soluble |
| …etylsalicylic acid | 5 g. | 10 | not soluble |
| …naphthol | 5 g. | 10 | soluble |
| …naphthylamine | 5 g. | 10 | soluble |
| …midophenol (ortho) | 5 g. | 10 | not soluble |
| …midophenol (para) | 5 g. | 10 | not soluble |
| …myl acetate | 5 c.c. | 5 | soluble |
| Amyl alcohol | 5 c.c. | 5 | soluble |
| Aniline oil | 5 c.c. | 5 | soluble |
| Anisidine (ortho) | 5 c.c. | 5 | soluble |
| Anthracene | 5 g. | 10 | not soluble |
| Anthranilic acid | 5 g. | 10 | not soluble |
| Anthraquinone | 5 g. | 10 | not soluble |
| Benzaldehyde | 5 g. | 5 | soluble |
| Benzene | 5 c.c. | 5 | soluble |
| Benzidine | 5 g. | 10 | not soluble |
| Benzoic acid | 5 g. | 10 | not soluble |
| Benzyl chloride | 5 c.c. | 5 | soluble |
| Benzyl acetate | 5 c.c. | 5 | soluble |
| Benzyl alcohol | 5 c.c. | 5 | soluble |
| β-naphthol | 5 g. | 10 | not soluble |
| β-naphthylamine | 5 g. | 5 | not soluble |
| British gum | 5 g. | 5 | not soluble |
| Brombenzol | 5 c.c. | 5 | soluble |
| Bromoform | 5 c.c. | 5 | soluble |
| Butyl acetate | 5 c.c. | 5 | soluble |
| Butyric acid | 5 c.c. | 5 | soluble |
| Caffeine | 5 g. | 5 | not soluble |
| Camphor (gum) | 5 g. | 5 | not soluble |
| Camphor, monobrom | 5 g. | 5 | not soluble |
| Carbazole | 5 g. | 5 | not soluble |
| Casein | 5 g. | 5 | not soluble |
| Castor oil | 5 c.c. | 5 | not soluble |
| Cellulose acetate | 5 g. | 5 | not soluble |
| Chinawood oil | 5 c.c. | 5 | not soluble |
| Chlorbenzol | 5 c.c. | 5 | soluble |
| Chloral hydrate | 5 g. | 5 | not soluble |
| Chloramine | 5 g. | 5 | not soluble |
| Chloroform | 5 c.c. | 5 | soluble |
| Citric acid | 5 g. | 5 | not soluble |
| Coconut oil | 5 c.c. | 5 | not soluble |
| Collodion | 5 c.c. | 5 | soluble |
| Cottonseed oil | 5 c.c. | 5 | not soluble |
| Cresylic acid | 5 c.c. | 5 | soluble |

### Furfuryl Alcohol as the Solvent

| Solute | Amount of solute | Amount of solvent c.c. | Remarks |
|---|---|---|---|
| Acetanilide | 5 g. | 10 | not soluble |
| Acetone | 5 c.c. | 5 | soluble |
| Acetylsalicylic acid | 5 g. | 10 | not soluble |
| α-naphthol | 5 g. | 10 | soluble |
| α-naphthylamine | 5 g. | 5 | soluble |
| Amido phenol (ortho) | 5 g. | 10 | not soluble |
| Amido phenol (para) | 5 g. | 5 | not soluble |
| Amyl acetate | 5 c.c. | 5 | soluble |
| Amyl alcohol | 5 c.c. | 5 | soluble |
| Aniline oil | 5 c.c. | 5 | soluble |
| Anisidine (ortho) | 5 c.c. | 5 | soluble |
| Anthracene | 5 g. | 5 | not soluble |
| Anthranilic acid | 5 g. | 10 | not soluble |
| Anthraquinone | 5 g. | 5 | not soluble |
| Benzaldehyde | 5 c.c. | 5 | soluble |
| Benzene | 5 c.c. | 5 | soluble |
| Benzidine | 5 g. | 10 | not soluble |
| Benzoic acid | 5 g. | 10 | not soluble |
| Benzyl chloride | 5 c.c. | 5 | soluble |
| Benzyl acetate | 5 c.c. | 5 | soluble |
| Benzyl alcohol | 5 c.c. | 5 | soluble |
| β-naphthol | 5 g. | 10 | soluble |
| β-naphthalamine | 5 g. | 5 | not soluble |
| British gum | 5 g. | 5 | not soluble |
| Brombenzol | 5 c.c. | 5 | soluble |
| Bromoform | 5 c.c. | 5 | soluble |
| Butyl acetate | 5 c.c. | 5 | soluble |
| Butylic alcohol | 5 c.c. | 5 | soluble |
| Butyric acid | 5 c.c. | 5 | soluble |
| Caffeine | 5 g. | 5 | not soluble |
| Camphor (gum) | 5 g. | 5 | not soluble |
| Camphor, monobrom | 5 g. | 5 | not soluble |
| Carbazole | 5 g. | 5 | not soluble |
| Casein | 5 g. | 5 | not soluble |
| Castor oil | 5 c.c. | 5 | not soluble |
| Cellulose acetate | 1 g. | 5 | forms gel |

| Solute | Amount of solute | Amount of solvent c.c. | Remarks |
|---|---|---|---|
| Chinawood oil | 5 c.c. | 5 | not soluble |
| Chlorbenzol (mono) | 5 c.c. | 5 | soluble |
| Chloral hydrate | 5 g. | 5 | not soluble |
| Chloramine | 5 g. | 5 | not soluble |
| Chloroform | 5 c.c. | 5 | soluble |
| Citric acid | 5 g. | 5 | not soluble |
| Coconut oil | 5 c.c. | 5 | not soluble |
| Collodion | 5 c.c. | 5 | soluble |
| Cottonseed oil | 5 c.c. | 5 | not soluble |
| Cresylic acid | 5 c.c. | 5 | soluble |

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## THE SITUATION IN AUSTRIA AND CZECHO-SLOVAKIA

The economic war between Germany and Austria has forced Austria to turn to other countries for supplies, and the Austrian Chancellor's recent visit to London indicates the direction in which the country is looking for help. Everybody wishes business relations between Austria and England to be intensified as much as possible, and many goods, especially some chemical products, can be provided only by England. It is hoped to increase trade relations between Austria and England to the extent of doubling and if possible trebling the proportion hitherto attained in normal years. In the course of the last two years, English exports to Austria have gone back a little.

With regard to chemicals, Germany has been the chief supplier until now, smaller amounts coming from England, France, Hungary, and Czechoslovakia. Most of the chemicals hitherto coming from Germany can be replaced by England alone. In the first quarter of 1933 Austrian imports have included 4188 tons of chemical auxiliary substances, 2712 t. of chemical products, 856 t. of varnishes and colours, and 114 t. of pharmaceutical wares and perfumery. Of this total, Germany's share has been 2328 t. of auxiliary substances, 588 t. of chemical products, 442 t. of colours, 84 t. of drugs and perfumery, and England's share 20 t. of auxiliary substances, 23 t. of chemical products, 7 t. of colours, 0·5 t. of drugs and perfumery.

This proves clearly how modest England's participation has been until now, but the prospects for increasing it are most favourable, Austria having resolved to diminish German exports by half. Formerly Austria was able to compensate the surplus of imports from Germany by the sums spent by German tourists in Austria, but the lock-out measures now carried out by Germany against Austria endanger the financial equilibrium, and Austria is to adjust the balance by a reduction of German imports.

It would be difficult to decide just now the British-made goods having the best prospects of sale, although chemical auxiliary substances and chemical products will probably be considered before colours and pharmaceutical wares. Prospects are also good for chemical plant, which until now has been provided by Germany alone, plant for manufacturing artificial silk, cellulose, and paper, being in greatest request.

Political conditions in Austria are not likely to endanger trade or to hinder imports. Invigoration of commerce is confidently expected during the autumn season, and already some signs are noticeable.

In Czechoslovakia, many associations of wholesale and retail traders have invited their members to cease trading in German goods. Government measures are making imports from Germany more difficult, no impediments being raised however against imports from other countries, especially from England. The home industry in chemicals is at present passing through a crisis, the consumption of chemicals having decreased by 20% to 35%.

Of the articles which could most successfully be imported from England, good sales may confidently be expected for antimony and for quicksilver, the imports of which have increased tenfold this year without covering the demand, for calcined magnesia, aluminium hydroxide, arsenious acid, stannic oxide, litharge, and hydrogen peroxide. With the exceptions of tartaric acid and citric acid commerce in acid is not likely, the home industry being able to cover the demand. Salts of potassium, sodium, and ammonia could be supplied in large quantities; kainit has for the most part been imported from Germany as well as potash salts containing 18%—24% potash and chloride of potassium. Chile saltpetre comes either from Chile direct or via Hamburg, and the connexion with Hamburg could be taken over by England. There is a brisk demand for water glass in solution, also for potassium nitrate, potassium and sodium bicarbonate. The

same may be said of sodium sulphite, sodium bisulphite, and sodium hyposulphite. Sales of refined tartar are normal, but there are better sales of barium carbonate, calcium phosphate, lead pyrolignite, nickel sulphate, nickel-ammonium sulphate, and zinc sulphate. There is a brisk demand for gelatin, purified and dried, and for gelatin articles, for methyl alcohol and for oxides of sulphur. Sales of all other chemical auxiliary substances and chemical products are slack.

Varnishes, colours, pharmaceuticals, and perfumes are brought to Czechoslovakia from several countries besides Germany. In varnishes and colours, any variety is acceptable here. In perfumery, the British made article already has a fair market but sales are hindered by the high prices, other goods, especially the home-made article, being offered far cheaper. English goods pass through so large a number of intermediary hands, that before reaching the customer they have grown far more expensive than they need be. It is probable too that English firms export their produce without sufficient knowledge of the foreign market and its requirements resulting in some reluctance on the part of retail traders to place their orders with English firms.

An improvement in trade in Czechoslovakia will probably set in after harvest time, as is usually the case. Twice already a turn for the better seemed to have been imminent this year, but on both occasions the political changes in Germany unsettled matters. The importing firms in Czechoslovakia and Austria are most reliable and very conscientious as to payments, terms of payment being usually fixed at one to four months. German firms have very largely spoiled the market by granting long credit terms. For small sales, cash payment is for the most part expected. English firms trading with Czechoslovakia have always been strict in enforcing their own conditions, a circumstance from which German merchants have drawn much profit.

## ANNUAL GENERAL MEETING, NEWCASTLE

### VISITS TO WORKS

#### *The Visit to the Roman Wall*

On Wednesday afternoon, July 12, members enjoyed a diversion from the serious business of the meeting in an excursion to the Roman Wall. 'Buses started off from Armstrong College, one party going to Chollerford and another to Hexham, where lunch was taken as the guests of the City Council. The drive through the magnificent countryside of Northumberland was much enjoyed. After lunch both parties met at Housesteads, and left the road to walk out to the old Roman fort of Borcovicus. Adrian's Wall abuts on to the fort, which is in a remarkably fine state of preservation. Excavation work is still being carried out here by the Durham University Excavation Committee, and the examination of the fort was made very interesting by two members of the committee, Mr. Headley and Mr. E. B. Burley, who described the history of the fort, its layout, and incidents connected with its excavation. The party returned home by way of Hexham, where tea was taken at the Hydro.

#### *North Eastern Electric Supply Co., Ltd.*

A party proceeded on Thursday, July 13, to the Dunston Power Station of the company, and was much impressed, not only by the magnitude of this undertaking, but also by the immense care and forethought which had obviously been expended on its lay-out.

This power station is still incomplete, but the turbine house at present contains three 50,000-kw. Parsons' two-cylinder tandem turbo-alternators running at 1,500 r.p.m. The pressure of the steam at the stop-valve is 600 lb. per sq. in. and the temperature is 800° F. After the steam has passed through the high-pressure cylinders of the turbines, it is reheated to initial temperature before entering the low-pressure cylinders. The boiler houses are placed at right-angles to the turbine house. The west boiler house contains four Clarke Chapman generating units and four Babcock & Wilcox combined generating and re-heating units. All are fired by chain-grate stokers.

The Clarke Chapman units are capable of evaporating 156,000 lb. of water per hour to steam at a pressure of 625 lb. per sq. in., superheated to 825° F. The Babcock & Wilcox units are capable of evaporating 125,000 lb. of water per hour and simultaneously reheating 180,000 lb. of steam per hour.

The centralized control of the boiler plant was seen to be remarkably complete. The party showed much interest in the arrangement of the plant in the west boiler house, where ash from the chain-grate stokers is handled by water-trough scraper-link conveyors. The ash from the east boiler house, together with dust from the cyclone separators installed in both boiler houses, is removed by a sluicing system.

In starting up, the turbine oil is forced through the bearings at 1200 lb. pressure since, owing to the great weight, the oil film is forced out from the bearings when the machine comes to rest.

The pressure of the electrical energy generated by the alternators is 13,500 volts, and this is stepped-up, by outside transformers, situated on the south side of the turbine house, to 66,000 volts for transmission through 16 outgoing feeders.

The whole power station is very imposing, and the visitors much appreciated the opportunity of seeing the station, which has now been in operation since January this year.

#### *Co-operative Wholesale Society, Ltd.*

On Thursday afternoon, July 13, a party of about 36 members visited the Co-operative Wholesale Society's soap works at Dunston. They were met and welcomed by Mr. Baxter, the manager, who then dispersed the company among four guides, to whose painstaking patience and skill the highest praise is due. They explained every detail of the operations in a manner only possible with small parties. The building is of ferro-concrete on the Hennibique system, part of it being raised on piles on the river bed. Raw material for the works is taken overside from craft, and also received by rail. The various oils and fats are melted out in the basement into settling tanks, after which they are pumped to the soap-boiling room on the top floor,

when saponification is effected. The preparation of caustic soda from soda ash and lime takes place in another department. The curd soap descends in the course of manufacture until it reaches the loading dock level, from which despatch of finished goods is made by rail or road transport.

Numerous ingenious machines and labour-saving devices are in use. The visitors were particularly impressed with the new spray air drier for making powdered soap ; in it a blast of cold air produces a sand-storm at the top of the kiln, a snowstorm below, and a layer of dry, very fine soap powder on the floor.

All kinds of soap are made here, including household, tablets and bars, soft soap, dry soap powders, polishing powders, etc., toilet soaps in great variety, and a number of toilet sundries. The works are capable of turning out 250 tons of soap per week, and employ nearly 200 workers.

The party was struck by the absence of the smells one usually associates with a soap factory, and the cleanliness of everything and the cheery countenances of the girl operatives paid eloquent tribute to the efficiency of the welfare arrangements.

The C.W.S. afterwards entertained the visitors to a very ample tea, and later provided all with acceptable samples of the factory's products. Dr. H. E. Cox expressed to the directors and local manager the thanks of the Society and members present for a very pleasant and instructive afternoon.

### C. T. Maling & Sons, Ltd.

On Thursday, July 13, a party of some 30 members visited the Ford Potteries of the above company, to inspect, under the guidance of Mr. Fred Maling and his colleagues, the processes involved in the manufacture of white earthenware.

These works were originally started at Sunderland in 1762 by Christopher Thomson and John Maling. In 1817 the works were removed to Newcastle and the firm became renowned for its manufactures of white pottery and earthenware. Some fifty years after the removal a new factory was built, and it was this factory that the party had the pleasure of visiting. The work is now carried on by the third and fourth Christopher Thomson Maling and Fred T. Maling, a record of continued management by one family that would be hard to match.

The preparation of the raw materials, and the subsequent modelling of the articles, was observed with keen interest. Nothing but white earthenware is made, and the range in this is from jam jars to dinner, tea, and fancy ware, as well as sanitary ware. China, brown or stone ware is never made.

The handling of the clay and its manipulation into different articles was seen, together with the method of "firing" and modes of temperature control. The party also witnessed the methods employed in the decoration of earthenware, including the operations of dipping or glazing, and "glost" firing. Much interest was shown in the processes of painting and gilding, and it is rumoured that one of the officers of the Society is considering an offer of a week's trial, as a result of his artistic efforts in the hand-painting department! The differences between painted, printed, and lithographed ware were also demonstrated. Finally, the party w. able to see displayed in the showroom of the compar all the types of ware manufactured in the Ford Potter many of the samples being finely coloured, or what ma be described as "in full war paint."

### Armstrong-Saurer Commercial Vehicles, Ltd.

This company is a combination of Sir. W. G. Arr strong, Whitworth & Co., Ltd., a famous Newcast firm, with the Adolfe Saurer Company of Switzerlan and specializes in the manufacture of road vehicl driven by high-speed heavy-oil engines. On Thursda July 13, a party visited the Scotswood Works of tl company and on arrival were conducted round in tv parties. The parties first saw the Rough Stores, which the raw materials are kept, and then proceed through the machine shops where the most mode types of equipment were seen turning out the vario component parts, through the heat-treatment depar ment, the assembling shops, and finally to the Finish Stores.

Heat-treating of metals was illustrated on an imposi scale, and in the huge shed devoted to this section of tl work there were gas-fired furnaces with electric pyr meter control and automatically-controlled electr resistance furnaces, and many other examples of tl most modern equipment for heat-treating metals. the testing room, two finished engines were tried out the bench and several complete heavy road vehicl were inspected.

The assembling of the chassis units and the erectic of vehicles follows the most up-to-date practice. Un assembly benches are arranged in a large shop so th assemblies correspond in time and place to the forwa movement of the chassis along the main straight erecti line.

Continuing from the Armstrong-Saurer Wor into the adjoining Armstrong-Whitworth sheds, mer bers saw the manufacture of boilers and other hea machinery. Particular interest was shown in t testing on lines outside the works of a Diesel-engin railway saloon coach completely fitted ready for use.

Tea was provided in the main canteen by the ki invitation of the directors. A vote of thanks on beha of the Society was proposed by Mr. C. T. W. Moore.

### Consett Iron Co., Ltd.

The Derwenthaugh Coke Works of the Consett Ir Co., Ltd. are situated on the bank of the River Derwe about three miles out of Newcastle, and it must ha been something of a revelation to most of the twen or thirty visitors on Thursday, July 13, that a co works could be associated with such pleasant surroun ings.

The visitors were first shown how the coal from t companies various collieries is blended. The coal received in the factory in wagons which are all of tl bottom-dumping type, and the coal is discharged in track hoppers, which deliver on to a system of rubbe belt conveyors, and blending is controlled by adjusti the flow of coal from these hoppers. Coal of more th $1\frac{1}{2}$ in. size is then treated in a Bradford breaker and t resulting coal joins the smaller coal on a belt convey

h elevates it to the top of a Birtley dry-cleaning t. Here it is discharged into a shute which distri- s it over a Hum-mer screen of $\frac{1}{8}$ in. mesh. The rsize is delivered into a storage hopper, whilst the size is screened again to $\frac{1}{2}$ in. size. The two "fines" separated are passed through cascade type aspira- for the removal of dust, and through pneumatic rators, which separate the clean coal from shale etc. coal is then crushed in two hammer mills to $\frac{1}{8}$-in. and passes to storage in a large concrete bunker of tons capacity.

fter seeing the Bradford breaker and Birtley dry ner at work, the visitors passed on to the coke ovens. se are of the Otto twin-flue regenerative type, there are two banks of 33 ovens, each 14 ft. by 45 ft. 1s in. During the inspection the party was able see one of the ovens pushed through into the coke- nching car, which has an inside length of 52 ft. is the largest in use in this country. The coke quenched in a tower, the sprays of which are auto- ically operated by the coke car as it enters and leaves. e1 the coal-charging larry was seen at work, and an resting time was spent in inspecting the gas-heating ngement below the ovens.

he gases from the ovens are drawn off through mild- l ascension pipes, lined with refractory material. austers draw the gas from the ovens through lers and deliver it through the sulphate plant, final lers and benzol scrubbers to the gasholder and ovens. t of the surplus gas is taken by the booster from the holder through the naphthalene extraction plant and vered to the Newcastle-upon-Tyne and Gateshead Company.

he visitors inspected the plant in which dry neutral phate of ammonia is produced, and finally saw the zol-recovery plant, which consists of heat exchangers, an pre-heaters, benzol still, condensers, benzol hers, refining still, etc., and is arranged for recovery direct washable product for making motor spirit, or producing washed and refined benzol. The acid m the benzol washers is treated in an acid regenerating nt placed outside the building, the recovered acid wing to the mother-liquor well in the sulphate house. The party was entertained to tea by Mr. E. J. George, naging director, and Mr. Middleton, manager of the product plant, and Dr. R. H. Pickard expressed to m the thanks of the Society for providing the oppor- ity of such an interesting visit.

### *wan, Hunter, & Wigham Richardson, Ltd.*

A party of nearly thirty visited the dry docks of an, Hunter & Wigham Richardson, Ltd., on Thurs- y, July 13. The first part of a very pleasant journey through the centre of Newcastle, but the party was on descending the steep banks of the "Side" to the ndhill, past the romantic house from which Bessie rtees eloped, thence past the Guildhall and Com- ercial Exchange, underneath the massive arch of the ne Bridge to the Quayside, where the party embarked the Tyne Improvement Commissioners' launch for e journey down the river.

The visitors were met by Mr. Richardson, one of the rectors of the company, and first shown the new graving dock in course of construction, and which, it is hoped, will be completed in twelve months time. When com- pleted, this dock will be 570 ft. long, with an entrance width of 80 ft. The existing graving docks alongside are 561 ft. and 495 ft. long respectively, and many could not but admire the enterprise of the company who were optimistic enough to spend the large sum of money necessary to construct a new dock.

The next objective was an immense glass-roofed shed where a 12,000-ton boat was being built for the Common- wealth and Dominion Line. When completed, this ship will be used for carrying refrigerated cargoes between London, Australia, and New Zealand. It was in this same shed that the Cunarder "Mauretania" was built 26 years ago.

Farther on was the keel plate, just laid down, of the cruiser "Phæton," and all were amazed at the enormous length of this plate. Still further on were to be seen the embryo structures of two torpedo boat destroyers—the "Esk" and the "Express"—which, when completed, will be capable of very high speeds.

Finally the party boarded the whaling factory, "Vikening," which had been built at this yard some two or three years ago, and was now undergoing certain alterations and repairs. This is a complete floating factory capable of accommodating 14,000 tons of whale oil, and a striking feature is the enormous clear deck space on to which the whales are hauled through a specially constructed stern by two powerful steam winches, after which they are cut up and the blubber shot into special boilers, the inlets of which are flush with the deck. The offal etc. is fed to pigs, which are accommodated in special styes "'tween" decks, and they, in turn, are slaughtered and used as food for the crew.

In the offices the party saw several models of famous ships which the firm had built, and learned from Mr. Richardson many interesting facts relating to the works, among which was that during some excavations rendered necessary for the building of the Cunarder "Carpathia," in 1896, the end of the Roman wall had been unearthed. The company now employs 1500 men, although only six months ago this total was 400. When in full operation, the Wallsend and Neptune Works employ a total of 5000 employees.

The whole party was entertained to tea in the com- pany's staff room, and Mr. E. M. Myers, on behalf of the guests, suitably thanked Mr. Richardson and his fellow directors for their kindness and hospitality.

### *A. S. Wilkin, Ltd.*

Over 40 members were the guests on Thursday, July 13, of Messrs. A. S. Wilkin, Ltd., at the Garden Toffery, Cremona Park, Benton. The works are particu- larly well situated, being within a few hundred yards of the New Hall, Benton, and near the playing fields of Armstrong College, away from the heart of the city. This model factory is equipped with the most modern plant for handling its products, and as much as 20 tons of toffee are produced daily.

On entering the factory the visitors were shown the stores of sugar, milk, vegetable butter, and glucose;

in other departments there were nuts in many varieties, figs, preserved cherries, ginger, angelica, and other delectable ingredients which constitute the raw materials of the toffees and nougats for which the firm is celebrated.

Great attention has been given to the general lay-out of the plant to avoid unnecessary carriage, and the greatest emphasis is laid upon cleanliness. Not only are the buildings steam heated, but steam boiling in copper pans with mechanical mixing is the rule. Dust, and contamination generally, are in this way eliminated, and even outside the workshops every available piece of ground is laid out as a garden to promote amongst employees the ideas of order and cleanliness.

The firm's products are supplied to the public in many attractive wrappings, and the machines which do this wrapping were objects of considerable interest to the party, some of these machines wrapping as many as 380 pieces a minute. The packing room was also found to be very attractive, and particularly the section devoted to packing for export. In this section the containers are evacuated before sealing, a process which it is claimed would enable the contents to be kept for 20 years and still be in good condition.

Tea was kindly provided by the directors. Dr. Colgate, in proposing a very cordial vote of thanks to the firm, said it was manifest that the Cremona toffees are manufactured under hygienic conditions and with the help of the most up-to-date machinery. In reply, Mr. A. S. Wilkin said that the object of his company was to produce toffee on modern and cleanly lines. The firm's policy was to give the public the fullest possible confidence in the commodity they were invited to purchase

## I.C.I. (Fertilizer & Synthetic Products) Ltd.

The Newcastle meeting was notable for many things, and not least among them the visit to Billingham. Every chemist, no matter what his special interest, knows Billingham not only as the centre of the nitrogen industry in this country, but in some respects also as part of the foundation on which chemical industry in this country now stands. Here, then, was at last the opportunity of seeing the great works of Imperial Chemical Industries, Ltd., and more than a hundred visitors to Newcastle took advantage of the opportunity.

The lines on which the visit was conducted were such as one has come to expect of I.C.I. The party was divided into sections and these into units, each with attendant guides, so that everyone of the large company was able personally to discuss points of interest with those actually engaged in running the works.

To begin with, the whole party was received in the Synthonia Club by the managing director, Dr. R. E. Slade. The name of the club was expressive of much that was to follow, for the large area on which the enormous works stands is crossed by "Ammonia Avenue," "Nitrates Avenue," and so on. Dr. Slade briefly explained to the visitors the layout of the factory, and his remarks, coupled with the lantern slides and plans which were shown, must have impressed many, perhaps for the first time, with the great natural advantages possessed by the Billingham site in its proximity to c... iron, and salt reserves, rail transport facilities, and wat... ways. In the same building a display of the company... products was to be seen, particular interest being show... by visitors in the samples of "Drikold" and the equi... ment used for its storage and transport.

Lunch was then taken, at which Dr. Slade expres... his pleasure at the Society's visit to Billingham, a... Dr. Pickard on behalf of the Society thanked th... company for its hospitality. The tour of the works the... began, beginning at the north side of Nitrates Avenu... This avenue runs for more than a mile from the Mai... Gate to the East Gate, with the huge buildings of th... factory on both sides of it. There are three main avenue... in the factory running from East to West, with cro... roads running from North to South connecting the mai... avenues. The main feature of the avenues is the ove... head pipe lines, for there is little underground at Billing... ham except drainage channels. It would be impossibl... in this short note to describe, or even to mention, all th... plants in the vast layout of the works, but of the building... seen in passing down Nitrates Avenue mention must b... made of the ammonium nitrate plant, with its stee... tanks and plant largely constructed of acid-resistin... steel, and the methanol and experimental coal hydro... genation plant which has come into such prominenc... owing to the events of the past week or two.

The power station in the works is the eighth larges... power station in this country, and visitors spent a... interesting time here, many of them no doubt surprise... at the extent to which the power of the whole factory... with its many branches, is centralized. Visitors the... passed to the hydrogen plant, in which the mixture o... gases coming from the gas plant is converted to a mixtur... of hydrogen and nitrogen. A gas holder is to be see... here of capacity 1,250,000 cb. ft. which is a sufficien... supply for 12 minutes working. In passing, the... Drikold plant was seen, and visitors saw the solid... $CO_2$ being extruded in cylinders before being sawn int... required sizes and packed for transport.

The visitors then entered the building which holds th... compression plant, huge 5000-h.p. rotary compressors... raised on massive concrete piers, and outside the succes... sive compressions of the gas were marked by reductions... in size of the pipes carrying gas from one building to... another. After walking along Ammonia Avenue, past... the purification plants, the parties then came to the... synthesis plant, the vital part of the whole factory. Here there were to be seen the 100-ton forgings, the... largest forgings ever produced, in which the synthesis... of ammonia is carried out.

Afterwards the ammonia is converted to ammonium sulphate, and in succeeding buildings the visitors saw the plant for this operation, then the large evaporators with which the solution is crystallized, and then the two huge rotary dryers in which the sulphate is dried at the rate of 1000 tons a day. Finally the party saw an extraordinary piece of industrial architecture in a massive parabolic silo, capable of holding 100,000 tons of ammonium sulphate. Inside this building the sulphate is kept perfectly dry, and when it is needed a machine, which was seen at work, scrapes the material from the

..e heap into a travelling band below ground level, ..ere it is conveyed to the packing shed.

It is hard to sum up an impression of Billingham ..thout using many superlatives, but most of the visitors ..ill retain an impression of gigantic operations carried .. with simple orderliness. The visit was a fitting ..nclusion to the Newcastle meeting.

### The Ashington Coal Co., Ltd.

This company owns four collieries, producing a ..al of 3,000,000 tons of house and steam coal per annum. On Friday, July 14, a party visited the Ashington Colliery, which is the oldest and largest of the ..oup, and is the centre for technical administration, ..pplies, and construction work for the group.

The visitors were received by Mr. Ridley Warham, managing director, Captain C. E. Pumphrey, Mr. J. J. Hall, agent, and Dr. Crawford, chief chemist. The whole party first descended the shaft and then divided into two, one half proceeding to the working face and the other inspecting the underground electrical arrangements, pumps, and pit pony stables etc. On returning ..e surface, a detailed inspection was made of the plant for handling and cleaning the various grades of ..al. The whole output of that colliery, together with ..me of the output from the other units of the group, is screened upon 3½-in. screens, and the undersize is treated ..n this plant. Part of this is dry cleaned, the larger ..uts on spiral separators, the smaller sizes on a Birtley pneumatic plant. The remainder is dealt with in a ..eolaveur washery. A wide range of sized coal is produced, suitable for any purpose where careful sizing ..nd a low and regular ash content is required.

Mr. Warham then explained the arrangements made .. the firm for the well-being of its 10,000 employees. The pits are provided with pithead baths, and a well equipped hospital is jointly operated by company and workers. Along with the county authorities the company runs a continuation school for more promising boys. The Welfare Department runs playing fields and other activities at each of the collieries, and at Lynemouth, a new model village has been built in recent years. The party was entertained to luncheon at Lynemouth, and afterwards inspected part of the company's housing scheme, including the new village at Lynemouth under process of development. A cordial vote of thanks was passed to the directors on the motion of Dr. J. T. Dunn, .. which Mr. Ridley Warham replied.

On the return journey, a visit was made to Warkworth, where the party was entertained to tea at the invitation .. Herbert Shaw, Esq., D.L., J.P., formerly secretary of the Newcastle-upon-Tyne Chamber of Commerce, at his ..vate residence.

Subsequently the party concluded a very enjoyable ..d instructive day by returning to Newcastle via A..wick, when the opportunity was taken to view the ..ent ducal castle of the Percies.

### The North British Rayon Co., Ltd.

..n contrast to the incursions made centuries ago from .. South into the Scottish border country, a peaceful ..ty of 38 visitors on Friday, July 14, was led by Drs. A. A. Hall and G. E. Stephenson, of the Newcastle Section, into the beautiful valley of the Jed to see the works of this company at Jedburgh. It was raining in Newcastle when the party left, but gradually the weather cleared and the beautiful Northumberland valleys and hilly moors were seen, if not always in brilliant sunshine, then at least under conditions which were characteristic and by no means displeasing and uninviting. Perhaps it was some disappointment that "Muckle" Cheviot was masked in cloud as the Border was crossed at Carter Bar, but the run down into the leafy Jed valley was fully appreciated.

On arrival at Jedburgh the party was welcomed by Mr. W. Hartley, the works manager, his staff, and the Provost of Jedburgh, Mr. Wells Mabon. A group photograph was taken and the party broke up into smaller sections for the inspection of the works under the efficient guidance of Mr. Hartley and his staff. During the tour much was learned of the ordinary routine process of a factory producing rayon yarn from wood pulp by the viscose process.

The operations may be briefly described as follows: Cellulose sheets are steeped in caustic soda solution, the excess being pressed out and the alkali cellulose disintegrated. After a period of maturing, the alkali cellulose is treated with carbon disulphide to produce a soluble xanthate which dissolved in weak alkali produces the viscose from which the process takes its name. This solution after suitable filtration and maturing is converted to continuous threads by drawing it out in contact with an acid bath which regenerates the cellulose. The cellulose thread is later washed, bleached, and finished.

This gives a bare outline of the process, but to many it was more interesting to learn of other points which indicate the progress made in the factory: of efficient temperature control, the attention paid to statistical and chemical control, and the progress made in by-product recovery, all of which have enabled this company to progress, since its inception in 1928 in spite of intense competition and the financial demands of the excise authorities. The harmonious relations prevailing between the company and the alkali inspector in Scotland were also brought to notice by the neat way in which they have jointly solved the problem of minimizing the nuisance of noxious gaseous effluent.

After the inspection of the works the party adjourned to the ancient Spread Eagle Hotel, where the company had provided an excellent lunch. Thanks were returned by Drs. Stephenson and Hall on behalf of the Newcastle Section and of the Society for the very cordial invitation and hospitality afforded to the visitors. In responding, Mr. Hartley read a message of regret from Mr. Walls, the chairman of the company, at his inability to be present to welcome the party in person.

The Provost, Mr. Mabon, in the name of the Burgh Council, welcomed the party to the ancient and Royal Burgh of Jedburgh, or "Jedart" (one of eighty ways of giving the name), and gave an interesting account of some episodes in the town's history.

The party was afterwards conducted by Mr. Mabon over the house where Mary Queen of Scots had stayed, where amongst other exhibits of note, there was a

300-year-old roasting jack which surprisingly incorporated a free-wheel mechanism.

A heavy rainstorm interfered with the visit to the ruins of the ancient Abbey and the party had hurriedly to board the bus for the return journey. The return was made down the pleasant Tweed valley, via Kelso and Coldstream, and from here south-east from the actual Border line to Wooler, where tea was taken, and then on to Newcastle.

### *Yorkshire Tar Distillers, Ltd.*

A party of members of the Plastics Group and other members of the Society, some of whom were returning from the annual meeting of the Society, and others who had not been to Newcastle, were entertained to lunch on July 11, in the Queen's Hotel, Leeds, by the directors of the Yorkshire Tar Distillers, Ltd., Leeds.

After lunch Major Lyon extended a welcome to the members of the Society, whom, he said, it was a pleasure to meet. Mr. H. V. Potter in reply thanked Major Lyon and his co-directors for their hospitality and courtesy in permitting the members of the Society to visit their works. It was evidence of the popularity of this visit that so many members had accepted the invitation.

After lunch the party were driven out to the Stourton works of the company and shown the various processes in operation there. The works covers 10 acres and contains much up-to-date plant for the production of the pure phenols, cresols, and xylenols which are so much employed in the plastics industry. The party was much impressed with the care and forethought with which the plant was laid out, provision being made for solid and oil fuel in the stills, and for the removal of obnoxious gases instead of allowing them to escape in the atmosphere. The efficient process for the removal of phenols and tar oils was favourably commented on. The fractions having close boiling ranges were extremely well separated. The pitch bed was situated in a favourable position for receiving discharges from the stills, and it was an impressive sight to see such a large weight of material being broken up for shipment.

The laboratories were then visited, and after taking tea the party was motored back to the station. The visit was thoroughly enjoyed by all who went.

## CANADIAN CHEMICAL INDUSTRY

The Dominion Bureau of Statistics at Ottawa reports that in 1932 the 14 groups into which the chemical industry is divided for statistical purposes had an aggregate production of $95,540,346, a decrease of 9·4% during the year. Three of the groups reported higher values, whilst 11 showed decreased output. Acids, alkalis, and salts showed a gain of 4% to a total of $11,357,649.

The total number of factories operated during the year was 628 as compared with 621 a year before. Of this total 343 were in Ontario and 182 in Quebec. Canada's imports of chemicals in 1932 totalled $27,861,580 of which 62% came from the United States and 17% from the United Kingdom.

# CORRESPONDENCE

## FRACTIONAL DISTILLATION

SIR,—As I have on several occasions attempted to operate home-made laboratory "controlled reflux condensers," perhaps Mr. R. McIntyre will pardon my suggesting a modification for the design shown in your issue of July 14, page 578. Unfortunately no dimensions are given with the illustration, but if this is to scale, I am of the opinion that the vapour tube which connects with the fractionating column should be of much greater diameter. Otherwise, severe limitations will be set for the speed of distillation and volume of reflux when dealing with high boiling liquids. Another alternative and a smoother working arrangement by far, though more fragile mechanically, would be to continue the vapour tube into the middle of the bulb and have a separate reflux tube coming from the bottom of the bulb parallel to the vapour tube into a two-hole stopper in the fractionating column.

It may be of interest to mention that single condenser control for fractionating columns has been in operation in both Scotland and England to my knowledge during the past eight years, and while the idea originated in America its importance as well as that of thorough lagging, is stressed in C. S. Robinson's "Elements of Fractional Distillation," published by McGraw Hill Book Co., which has a fairly wide circulation in Great Britain.

I am Sir, etc.,

ROBT. G. W. EADIE

Glasgow,
July 18, 1933

## THE ECONOMIC CONFERENCE AND AFTER

SIR,—Mr. Morris (cf. CHEM. & IND., July 21, p. 601) does not seem to have assimilated the parable of the man who fed his horse according to a law of diminishing imports. The marginal value of the last oat was found to be infinite and the horse died. Mr. Morris tells us that Labour should not demand minimum wages and that wages should depend only on prices. In applying this doctrine to meet competition from the East, the manufacturer may well find that his workmen have starved to death in the process and, more regrettable still, that their purchasing power has quite disappeared.

The enormous production of all countries during the war shows that it is only the financial system that prevents the same thing happening during peace. The laws of supply and demand and of market price may be true enough, but it is only through a conscious control of these laws through the money system that an economic structure can be built in which the absurdity of poverty with unemployment no longer exists. The principle of *laissez faire* applied to the law of gravitation would mean that we all had to live on the ground floor. And then we might never discover that there were bats in the belfry!

I am, Sir, etc.,

E. H. M. BADGER

Chiswick, W.
July 24, 1933

## PERSONAL AND OTHER ITEMS

The King of Italy has conferred the decoration of Commendatore of the Order of the Crown of Italy on Sir Robert Hadfield, Bt., F.R.S., in recognition of his scientific work.

Prof. Edward Mellanby, M.D., F.R.S., Professor of Pharmacology in the University of Sheffield, has been appointed secretary of the Medical Research Council in succession to the late Sir Walter Morley Fletcher. Dr. Mellanby will take up the duties of the post in January, 1934.

The University of Manchester has awarded the Mercer Scholarship in chemistry to Mr. A. R. Evans.

Dr H. G. A. Hickling of Armstrong College, Newcastle-on-Tyne, has been appointed external examiner for Ph.D degree theses in fuel technology at Sheffield University.

Dr. G. E. Foxwell has been appointed the London manager of Clayton, Son & Co., Ltd., the well-known manufacturers of gas plant, pipes, boilers, etc., whose London office is at 5, Victoria Street, S.W.1. Dr. Foxwell, who has been connected with the carbonizing industries for more than 20 years, will not relinquish his consulting practice.

Mr. H. C. Clanahan, a director of Bayley, Clanahan & Co., chemical manufacturers of Manchester, left estate of the gross value £15,992, with net personalty £11,701.

### John Gray Jubilee Scholarship

The John Gray Jubilee Scholarship for 1933—34 has been awarded to Miss Dorothy Freeman, who has been a student at Armstrong College, University of Durham, since 1929, when as a result of distinction in the examination for the Higher School Certificate, she was awarded a State scholarship to the University. In 1932 Miss Freeman obtained the B.Sc. (chemistry) degree with 2nd class honours, and with the help of a year's special extension of her scholarship has been carrying out research work on problems of physical chemistry. The award of the John Gray Jubilee Scholarship will enable Miss Freeman to continue this work and to complete the Ph.D. degree course. She has had some experience in industrial laboratories, and has been a member of the Society for the last two years.

### University of London

The Rockefeller Foundation has made a further grant of £4000 to London University for the reconstruction and equipment of additional laboratories at University College to afford better facilities for the work of Prof. A. V. Hill, Foulerton Professor of Physiology, and his research students.

### British Standard Specification for Coke

The British Standards Institution has just issued a British Standard Specification for the sampling and analysis of coke. The minimum weights of gross samples specified have been determined after extensive trials on both oven and gas coke. The basis of the specification is the same as that used for small coal, namely, to determine the variability of the coke and, from the theory of errors, to calculate the number of increments necessary for a specified degree of accuracy.

Provision has been made the the sampling of two classes of coke as follows: (1) Screened or unscreened coke containing not more than 10% below 2 in. at the place of manufacture and not more than 5% of moisture; graded coke (*e.g.*, coke nuts, cobbles, etc.); (2) Other cokes. It has been considered advisable to specify one method only for the sampling of coke for moisture, ash, sulphur, volatile matter, and other constituents. The particle size to which coke may be crushed without loss of moisture, the minimum weight of sample to be taken for moisture determination, and the particle size to which coke may be crushed before sampling for ash have also been determined by extensive trials.

A considerable amount of experimental work has also been carried out in connexion with the determination of the apparent specific gravity of gas and oven coke, but the results show that this property varies so considerably from piece so piece from the same batch that no simple laboratory method applicable to all types of coke can at present be recommended.

The use of this specification should reduce disputes between buyer and seller and should facilitate the sale of coke to specification, in which bonus and penalty clauses would encourage the production of finer and better cokes. Copies of this Specification (B.S.S. No. 496—1933) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

### Aslib Conference

The tenth annual conference of the Association of Special Libraries and Information Bureaux is to be held from September 22 to 25 this year in the Wills Hall, Bristol. The programme includes an address on "Efficiency with Economy in Chemical Abstracting," by Prof. J. C. Philip, who is well known to members of the Society as chairman of the Bureau of Chemical Abstracts until his resignation in December last. Sir Charles Sherrington, O.M., F.R.S., will give his presidential address, and Sir John Russell, F.R.S., will speak on "Books and Farmers." There will also be a symposium on "The Planning and Editing of Information Bulletins and House Journals," and a paper by Mr. S. W. Gibson on "Classification of Subject Titles for Engineering Periodicals."

### British Industries Fair: New Travel Facilities

A simplified plan of new travel concessions to encourage overseas buyers to visit the British Industries Fair has been adopted by representatives of leading Continental railway administrations, following a conference in London called by the Southern Railway. The Continental countries represented were Germany, Holland, France, Belgium, Switzerland, and Austria, and their railway administrations have agreed to issue through return tickets to London and/or Birmingham at reduced rates varying from 25% to 33⅓%. Reciprocal concessions are to be granted by the British railways to British visitors to Continental trade fairs which receive official recognition.

For the first time in the history of the B.I.F., the French railway administrations have agreed to through booking facilities at reduced rates for visitors travelling from or through France.

**Production of Ammonium Sulphate in Manchuria**

Plans are reported in *Die Chemische Fabrik* for the construction of a plant near Dairen for the yearly production of 180,000 t. of ammonium sulphate by the Uhde process. It is estimated that the production costs will be 48 yen a ton, and that the selling price will be 70 yen a ton. Production will commence in the middle of next year, and is expected to provide a surplus for export. The undertaking is being financed by a company with a capital of 25,000,000 yen.

**Production of Bauxite**

Figures published in *Die Chemische Industrie* show a big drop in world production for 1931 (1,062,000 t.), compared with 1930 (1,715,000 t.). Figures for 1932 are not yet available. In 1931 the French production was 319,000 t., that of the U.S.A. 199,000 t., and that of British and Dutch Guiana 310,000 t. France, Italy, Jugoslavia, and Hungary together contributed over half of the world production.

**Polish Glass Industry**

In 1932, 53 out of 88 glass works in Poland were idle. Production has shown a steady decline during the last three years. In 1930 it was 95,300 tons, in 1931 77,700 t., and in 1932 48,100 t. (Die Chemische Industrie).

**Production and Import of Potassium Salts by the U.S.A.**

According to the U.S. Bureau of Mines the production of potassium salts in 1932 was 143,120 short tons, with a potassium content of 61,990 short tons. The sources of supply are in California, Maryland, and in New Mexico. During 1932, 330,964 t. of potassium salts, with a potassium content of 113,500 t. were imported.

**Greaseproof Paper**

A new mill for the manufacture of greaseproof paper was recently opened at Dartford, Kent, by Greaseproof Paper Mills, Ltd., a subsidiary of Wiggins Teape & Co., Ltd. The new mill incorporates many up-to-date improvements in the process of paper making, and has an output capacity of 15,000 tons a year.

**Aluminium Utensils**

There has been and is still considerable difference of opinion amongst food chemists as to the extent to which aluminium can with safety be employed for food processing plant and utensils. Those who are concerned with this problem will find a bulletin (No. 3—Bibliographic Series) recently issued by the Mellon Institute of much help in studying the evidence presented on both sides. The bulletin is entitled "A Select Annotated Bibliography on the Hygienic Aspects of Aluminium and Aluminium Utensils," and in this the whole question has been thoroughly examined, and a strong case is made out for regarding aluminium as harmless. A point which is stressed in the introduction by Mr. G. Beal, Assistant Director of the Mellon Institute, is that the foodstuffs concerned where poisoning by aluminium has been alleged, have never been strongly acidic, but rather of the proteinous type offering good media for the growth of toxin-producing bacteria of the paratyphoid-enteritus type. The many references should be of considerable help to other workers on food problems.

## COMPANY NEWS

### DORMAN LONG & CO. LTD.

Full details are now available of the scheme fo reconstruction of the company and its amalgam with South Durham Steel & Iron Co., pro being made for the financing of the scheme an for additional working capital. Shareholders of £8,311,482 ordinary capital are to receive £83 ordinary shares in the new company, and holders o £2,052,746 8% preferred ordinary shares will re £256,593 6% preferred ordinary shares. The pr holders of Dorman Long $5\frac{1}{2}$% debentures are to re 2,567,972 $5\frac{1}{2}$% debentures with modified right gether with £1,540,783 6% non-cumulative prefe shares and £1,540,783 ordinary shares.

### CELLULOSE ACETATE SILK CO., LTD.

At the fifth annual ordinary meeting of the com recently the chairman, Sir J. Donald Horsfall, Bt. that the year had been one of unprecedented diffic and it was gratifying to be able to report a subst net profit in spite of such conditions. (For fina results cf. CHEM. & IND., July 14, p. 589.) The chai referred to the unfair competition resulting from labour abroad. The competition from Japan w menace not only to the home market, but also to Britain's markets overseas. In East Africa, J had now captured 98% of the total business in sil artificial silk and was supplying 10 times more art goods in Ceylon than was Great Britain. Pros for the current year were, however, much better t year ago. Although only a quarter of the fin year had gone the company's plant had been i operation for this time.

### PHARMACEUTICAL PRODUCTS, LTD.

A company with the name Pharmaceutical Pro Ltd. has been formed by Savory & Moore, pharmaceutical manufacturers, to finance and de agencies for various products such as Condy's The total issued capital is £175,000, of which £12 is in the form of $6\frac{1}{2}$% redeemable preference share issue having been heavily over-subscribed. The e issued ordinary capital is owned by Savory & M Ltd.

### NEUCHATEL ASPHALTE CO.

The accounts of the company for 1932 show profit of £10,412, as against £15,851 for the previous Preference dividend absorbs £10,000, and the Ord dividend of 3d. per share, the same rate as last yea absorb £5248.

### UNITED STATES STEEL CORPORATION

The Corporation has declared a quarterly divide 50 cents per share on the cumulative preferred This is the same as last quarter, and a reduction fro usual dividend, which is $1.75. The corporation re a net loss for the quarter of $16,730,000.

### I. G. FARBENINDUSTRIE

The report of the trust for the second quar 1933 shows that the slow improvement in the shown in the first quarter was maintained.

business in pharmaceuticals, insecticides, and photographic materials was a little better than last year, and there was altogether an improvement in the home market. Exports are however meeting with many difficulties. Sales of nitrogenous fertilizers showed an increase of 6·5% compared with the second quarter of last year.

Petrol is being regularly produced now at the Leuna works by the hydrogenation of brown coal. This process was begun some years ago, but was discontinued for several years in favour of distillation of tar and oils. Improvements in the process of hydrogenation and shortage of supplies of mineral oil, have caused a reversion to the raw material of which ample supplies are available.

### CHEMICAL AND METALLURGICAL CORPORATION, LTD.

The accounts of the company for 1932 show a net profit of £2279 after provision of £13,106 for depreciation, as compared with last year's profit of £8831, with depreciation £5397. An offer to acquire the whole of the issued share capital of £210,340 has been made by Imperial Chemical Industries, Ltd. For 10 preference shares of £1 I.C.I. offers 8 of its own ordinary shares of £1, and for 40 of the corporation's 2s. shares, four I.C.I. ordinary shares are offered. The offer of Imperial Chemical Industries is subject to 90% acceptance by August 24.

### DRUG INCORPORATED

Following the recent announcement (see CHEM. & IND., July 7) that Drug Incorporated is to be dissolved and the five subsidiary companies re-established, a statement has now been made of the earnings contributed by the five companies during 1932. Of these the United Drug Co. shows a net loss of $2,451,437, the total assets being $54,994,121, whilst the remaining four companies show net profits as follows: Sterling Products Inc., $9,348,314; Bristol Myers Co., $2,447,130; Life Savers, Inc., $885,257; Vick Chemical Co., $2,625,761.

### HOLLANDSCHE KUNSTZIJDE INDUSTRIE BREDA

The report of this Dutch company, manufacturing artificial silk, shows a net loss for 1932 of £566,000 (at par) compared with £110,000 last year. The directors of the company, which belongs to the Aku-Breda group, propose to write down the issued capital from its present value of about £1,250,000, to £750,000, and to place a reserve of £63,000 to depreciation. The report states that the British subsidiary company, Breda Visada, of Littleborough, effected better sales than last year, but sales were not however satisfactory.

### BRITISH TINTEX AND DYE PRODUCTS, LTD.

An extraordinary meeting of the company is to be held on August 15 to consider a scheme of liquidation and reconstruction. During the year ended March 31 last the company sustained a loss of £876, bringing the debit to £40,084. It is proposed that a new company shall be formed with the name Tintex Dyes & Products, Ltd., with £17,503 additional capital to be provided by holders of present 6d. shares (700,130) who will be offered new 3s. shares and be credited with 1s. 6d. for each share at present held.

## MARKET REPORT

This Market Report is compiled from special information received from the manufacturers concerned.

*Unless otherwise stated, the prices quoted below cover fair quantities net and naked at sellers' works.*

The following alterations in prices are reported since the publication of the last Market Report (cf. CHEM. & IND., July 7, 1933, p. 569).

### TAR PRODUCTS

**Acid Cresylic, 99/100.—11d.—1s. 8d. per gal., according to specification. Refined, 1s. 7d.—1s. 8d. per gal.** Pale, 98%, 1s. 3d.—1s. 4d. per gal. 95%, 11d.—11½d. per gal. Dark, 10d. per gal.

Toluole.—90%, 2s. 1d.—2s. 2d. per gal. Pure, 2s. 5d. per gal.

Xylol.—2s.—2s. 1d. per gal. Pure, 2s. 3d.—2s. 4d.

## PATENT LIST

The following is a list of complete specifications of chemical interest which are open for inspection under Section 91 (4) (a) of the Patent Acts. Printed copies are not available, but photographic copies may be obtained at a charge of 8d. per page (minimum 1s.) from the Patent Office, Chancery Lane, W.C.2.

**I.** 30,587 (1932). Holstein & Kappert Maschinenfabr. Plate heat-exchange apparatus for liquids.

36,912—3 (1932). Enzinger-Union-Werke. Filters.

636 (1933). Filtering steam.

777—8 (1933). Herpen and Vorkauf. Cleaning of dust-containing flue gases.

**II.** 35,794 (1932). Krczil. Producing active charcoal or reactivating spent charcoal.

777—8 (1933). Herpen and Vorkauf. *See* I.

**III.** 36,107 and 36,336 (1932). 15,644 and 15,646 (1933). Henkel & Co. Manufacture of high-molecular organic esters.

15,645 (1933). Henkel & Co. Manufacture of high-molecular compounds.

19,551 (1933). Böhme A.-G. *See* XX.

**IV.** 388 (1933). I. G. Farbenind. Manufacture of dyestuffs of the anthraquinone series.

**V.** 173 (1933). Durand & Huguenin A.-G. *See* VI.

301 (1933). Geigy A.-G. *See* VI.

317—8 (1933). Deuts. Bekleidungsind. Ges. Treatment of felts for paper machines.

**VI.** 173 (1933). Durand & Huguenin A.-G. Producing fast prints on cellulose ester fabrics.

301 (1933). Geigy A.-G. Dyeing acetyl cellulose and mixed materials containing acetylcellulose.

**IX.** 36,139 (1932). Dreyer and Kutzner. Apparatus for treating binding materials etc.

510 (1933). Snell. Cements.

**X.** 250 (1933). Junker Ges. *See* XI.

416 (1933). I. G. Farbenind. Production of coatings on light metals.

**XI.** 250 (1933). Junker Ges. Electric muffle furnaces.

**XIV.** 36,377 (1932). Naugatuck Chem. Co. Producing vulcanized rubber.

415 (1933). I. G. Farbenind. Vulvanization of rubber.

**XVIII.** 634 (1933). Braasch and Braasch. Production of yeast.

**XIX.** 774 (1933). Galbani. Pasteurized and herborized cheese.

**XX.** 31,690 (1932). Lilly & Co. Therapeutic compounds.

604–6 (1933). Lehn & Fink, Inc. *See* XXIII.

19,551 (1933). Böhme A.-G. Production of chlorsulphonic acid esters of glucosides.

**XXI.** 289 (1933). Gaspar. Producing colour-photographic printing-out images.

290 (1933). Gaspar. Producing colour-photographic bleach-out images.

**XXIII.** 604–6 (1933). Lehn & Fink, Inc. Obtaining of antibacterial and germicidal action.

## GENERAL NOTES

### Official Trade Intelligence

The Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, has received the following inquiries for British goods. British firms may obtain further information by applying to the Department stating the specific number. *Austria:* Chemicals for pharmacy (75). *Belgium:* Metal alloys, aluminium, copper, fireclay (82); Tinplate and black sheets (84). *France:* Black plates (G.Y. 12,793). *Kenya:* Machinery for dehydrating lucerne (A.Y. 11,890). *Palestine (Tel-Aviv):* Paint, iron, and steel (72). *Persia (Ahwaz):* Oils and paint (91). *Poland:* Oils and fats for soap manufacture (88).

### Import Duties

The Treasury has recently issued the Additional Import Duties (No. 14) Orders, 1933, by which certain modifications in the principal Additional Import Duties Orders are made. By this order refined ferro-manganese and vanadium-titanium pig-iron are exempted from all additional duties, whilst the maximum additional duty is placed at 5% in the case of wood flour and nitric acid, $6\frac{2}{3}$% in the case of kraft paper and machined glazed paper, and an amount in the case of steel which with the *ad valorem* duty will amount to £2 10s. per ton or 20% of the value of the goods, whichever is the greater.

By an order since made the Treasury has exempted from the general *ad valorem* duty gum arabic and cobalt metal (excluding alloys). This order dates from July 14.

The Import Duties Advisory Committee gives notice of application for the addition to the Free List of petroleum coke. Representations with regard to this application should be addressed to the Secretary, Import Duties Advisory Committee, Caxton House, Tothill Street, S.W.1, not later than August 16.

### An Industrial *X*-Ray Service

With the increasing number of applications which *X*-rays are finding in industry it is of much interest to learn of an *X*-ray service laboratory where manufacturers may submit their problems. Philips Industrial Radiographic Service, of Philips House, 145, Charing Cross Road, W.C.2, now caters for the manufacturers' requirements by maintaining a central laboratory to which specimens may be submitted, and a mobile *X*-ray apparatus which can be taken to manufacturers' premises for the examination of specimens *in situ*.

In connexion with this service an interesting booklet has been issued which shows many applications of *X*-rays to industrial problems. An excellent series of photographs illustrate the examination of welds, castings, aircraft components, textiles, foodstuffs, etc. and descriptions are given of the apparatus employed.

### New Grinding Equipment

L. A. Mitchell, Ltd., Chemical Engineers, of Harvester House, 37, Peter Street, Manchester, have been appointed sole British agents for the sale of the new Hildebrandt fine grinding mills and air separators. The Hildebrandt mill is capable of grinding hard and soft materials such as dyes, iron oxides, earth colours, minerals, etc. and reducing them to a fineness of 330 mesh.

In the following description it will be seen that the mill is of unusual design.

The balls forming the grinding medium are contained in a circular chamber consisting of a stationary grinding ring and revolving bowl. The material to be ground is fed continuously into the bowl where it is thrown by centrifugal force together with the balls against the grinding ring, which in turn throws the balls and material back into the bowl. A continuous air current sweeps down into the bowl, picking up the fine material and carrying it through a centrifugal air sifter of novel design. This consists of a fan wheel rotating at high speed. As the material must pass through this wheel from the outside towards the centre, the effective opening presented depends on the relative speed of the material and the wheel. Circulation of the air is provided by a fan mounted alongside the sifter but separately driven. Material rejected by the sifter is returned to the mill for further grinding. The fine-ground material from the sifter is discharged by the fan to a cyclone, where it is separated from the conveying air, which then returns to the mill. To adjust the fineness of the finished product, it is only necessary to alter the speed of the sifting wheel.

## PUBLICATIONS RECEIVED

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